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| 10/043,194 | 01/14/2002 | Wen-Yueh Jang | 4006-145 | 6170 |

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| EXAMINER | |
|---|---|
| TRAN, TAN N | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2826 | |

DATE MAILED: 05/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Application No. | Applicant(s) |
|---|---|
| 10/043,194 | JANG, WEN-YUEH |
| **Examiner** | **Art Unit** |
| TAN N TRAN | 2826 |

## *Office Action Summary*

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on *14 January 2002 and 20 March 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) *1-5,7-26 and 36-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) *15-26* is/are allowed.

6)☐ Claim(s) *1-5,7,11,12,36-40 and 45* is/are rejected.

7)☐ Claim(s) *8-10,13,14 and 41-44* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 January 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other

## DETAILED ACTION

### Information Disclosure Statement

1. If applicant is aware of any relevant prior art, he/she requested to cite it on form PTO-1449 in accordance with the guidelines set forth in M.P.E.P. **609.**

### *Drawings*

2. Figures 1, 2, 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### Claim Objections

3. Claims 7,8 are objected to because of the following informalities:

In claims 7,8, line 1, "in claim 6" should be changed to -- in claim 1--.

Appropriate correction is required.

### Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5,7,11,12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stengl et al. (5,844,266) in view of Applicant' prior Art (APA) in figs. 1 and 2 and further in view of Holmes et al. (6,316,309) and Clevenger et al. (6,399,447).

With regard to claim 1, Stengl et al. discloses a plurality of word lines (15,23) above the active area 82 and the shallow trench isolation 28, an array being formed by overlapping the word lines (15,23) and the active area 82, the array including a plurality of first overlapping portions and a plurality of second overlapping portion, wherein the first overlapping portion is separated by the second overlapping portions on the active area 82 and the first overlapping portion 15 is next to the second overlapping portion 23, a capacitor 20 being in each of the first overlapping portions 15, the capacitor 20 including a deep trench structure 12 and a collar isolation 18, wherein a memory cell is formed by the word line 23 in one of the second overlapping portions and the capacitor 20 in one of the first overlapping portions. (Note Figs. 1B, 3 of Stengl et al.).

Stengl et al. does not disclose a plurality of trip-type active areas on a substrate; a plurality of shallow trench isolations on the substrate for isolating each of the active areas; and a capacitor array in the active areas; a trench top isolation above the buried strap conductive layer, wherein the trench top isolation connects with the shallow trench isolation region.

However, APA discloses a plurality of trip-type active areas (AA) on a substrate 10; a plurality of shallow trench isolations 14 on the substrate 10 for isolating each of the active areas (AA); and a capacitor array 12 in the active areas (AA); a trench top isolation

above the buried strap conductive layer 26, wherein the trench top isolation connects with the shallow trench isolation region 14. (Note figs. 1,2 of APA).

Therefore, it would have been obvious to one of ordinary skill in the art to form the Stengl et al.'s device having a plurality of trip-type active areas on a substrate; a plurality of shallow trench isolations on the substrate for isolating each of the active areas; and a capacitor array in the active areas such as taught by APA in order for forming Dram cell.

Holmes et al. discloses every two of the first overlapping portions 450 are separated by every two of the second overlapping portions 350; wherein a memory cell formed by the word line in one of the second overlapping portions controls the capacitor. Note figs. 19,21 of Holmes et al. It would have been obvious to one of ordinary skill in the art to replace the first and second overlapping portions of Stengl et al.'s device by the first and second overlapping portions of Holmes et al. in order to ensures that control gates of adjacent word lines are not shorted along the direction of the bit lines.

Further, Clevenger et al. discloses the first collar portion being longer than the second collar portion in a depth direction of the deep trench and a depth of the second collar portion being the same as depth of the top plate; a buried strap conductive layer 301, above the second collar portion, including a diffusion conductive region in the substrate outside the buried strap conductive layer. Note figs. 1,3 of Clevenger et al. It would have been obvious to one of ordinary skill in the art to replace the first and second collar portions of Stengl et al.'s device by the first and second collar portions of Clevenger et al., in order to prevent leakage currents at the surface.

With regard to claim 2, Stengl et al. discloses a bottom plate on an interface region of the substrate 26 and a lower sidewall portion of the deep structure 12; a dielectric layer 24, formed on an internal surface of the bottom plate; and a top plate, formed by filling the deep trench structure and covering the dielectric layer 38 with a conductive material 70. (Note Figs. 1B, 2B,3 of Stengl et al.).

Applicant's claim 3 does not distinguish over Stengl et al., Holmes et al. and APA references regardless of the process used to form the bottom plate such as "thermal diffusion with an impurity gas".

Note that a "product by process" claim is directed to the product per se, no matter how actually made. In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases, as the above case law makes clear.

With regard to claim 5, Holmes et al. discloses the top plate comprises a polysilicon layer doped with arsenic. (Note lines 22-33, column 9, figs. 14,16 of Holmes et al.).

With regard to claim 7, Stengl et al., Holmes et al., APA and Clevenger et al. disclose all the claimed subject matter except for a thickness of the first collar portion and

the second collar portion is about 400. ANG. to 500. ANG. However, it would have been obvious to one of ordinary skill in the art to have a thickness of the first collar portion and the second collar portion is about 400. ANG. to 500. ANG. in order to decrease a leakage current at surface of trench.

With regard to claims 4,11, Stengl et al., Holmes et al., APA and Clevenger et al. disclose all claimed invention, except the dielectric layer is a composite layer comprising silicon nitride and silicon oxide and shallow trench isolation regions further comprises a silicon oxide layer. However, although Stengl et al., Holmes et al., APA and Clevenger et al. do not teach exact the material of shallow trench isolation regions and the dielectric layer as that claimed by Applicant, the material differences are considered obvious design choices and are not patentable unless unobvious or expected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note in re Leshin, 125 USPQ 416.

With regard to claim 12, Holmes et al. discloses a gate oxide layer 451 between the substrate 210 and the word lines 450. (Note fig.18 of Holmes et al.).

Claims 36,37,39-40,45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant' prior art (APA) in view of Clevenger et al. (6,399,447).

With regard to claims 36,45, APA discloses a deep trench structure 16: a bottom plate 20 on an interface region of the substrate 1 and a lower sidewall portion of the deep trench structure; a dielectric layer 20 formed on an internal surface of the bottom plate 18; a top plate 22, formed by filling the deep trench structure and covering the dielectric

layer 20 with a conductive material: a first collar portion being on an adjacent portion of two of the neighboring capacitors: a second collar portion being on a non-adjacent portion of two of the neighboring capacitors: a second collar portion being on a non-adjacent portion of two of the neighboring capacitors: and a buried strap conductive layer 24 above the second collar portion. (Note figs. 1,2 of APA).

APA does not disclose the first collar portion being longer than the second collar portion in a depth direction of the deep strench.

However, Clevenger et al. discloses the first collar portion being longer than the second collar portion in a depth direction of the deep strench. (Note fig. 1 of Clevenger et al.).

Therefore, it would have been obvious to one of ordinary skill in the art to form the APA's device having the first collar portion being longer than the second collar portion in a depth direction of the deep strench such as taught by Clevenger et al. in order to prevent leakage currents at the surface.

Applicant's claim 37 does not distinguish over Clevenger et al. and APA references regardless of the process used to form the bottom plate such as "thermal diffusion with an impurity gas".

Note that a "product by process" claim is directed to the product per se, no matter how actually made. In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must

be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases, as the above case law makes clear.

With regard to claim 39, Clevenger et al. discloses a depth of the second collar portion being the same as a depth of the top plate. (Note fig.1 of Clevenger et al.).

With regard to claim 40, Applicant' prior Art (APA) and Clevenger et al. disclose all the claimed subject matter except for a thickness of the first collar portion and the second collar portion is about 400. ANG. to 500. ANG. However, it would have been obvious to one of ordinary skill in the art to have a thickness of the first collar portion and the second collar portion is about 400. ANG. to 500. ANG. in order to decrease a leakage current at surface of trench.

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant' prior art (APA) in view of Clevenger et al. (6,399,447) further in view of Holmes et al. (6,316,309).

With regard to claim 38, APA and Clevenger et al. do not disclose the top plate comprises a polysilicon layer doped with arsenic.

However, Holmes et al. discloses the top plate comprises a polysilicon layer doped with arsenic. (Note lines 22-33, column 9, figs. 14,16 of Holmes et al.).

Therefore, it would have been obvious to one of ordinary skill in the art to form the APA and Clevenger et al.'s device having the top plate comprises a polysilicon layer

doped with arsenic such as taught by Holmes et al. in order to facilitate electron transfer through the buried strap.

**Allowable Subject Matter**

5. Claims 8-10,13,14,41-44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 8-10,13,14,41-44 are allowable over the prior art of record, because none of these references disclose or can be combined to yield the claimed invention such as and the word line further comprises a doped silicon layer and a silicon tungsten layer as a gate electrode as recited in claim 13, the trench top isolation connects with the shallow trench isolation regions in a word line direction as recited in claims 8,41.

6. Claims 15-26 are allowable over the prior art of record, because none of these references disclose or can be combined to yield the claimed invention such as the trench top isolation connects with the shallow trench isolation regions in a word line direction as recited in claim 15.

**Conclusion**

7. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tan Tran whose telephone number is (703) 305-3362. The examiner can normally be reached on M-F 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for after final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TT

May 2003